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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/016,294	11/02/2001	Sandra M. Troian	4555-110 US	9407

7590 12/14/2005

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EXAMINER

CHAMBERS, A MICHAEL

ART UNIT	PAPER NUMBER
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3753

DATE MAILED: 12/14/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/016,294

Applicant(s)

TROIAN ET AL.

Examiner

A. Michael Chambers

Art Unit

3753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on July 25, 2005 (After Final Amend. & RCE).
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-83,98 and 99 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-83,98 and 99 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This application has been examined. This application a Request for Continued Examination (RCE) filed July 25, 2005. The application was abandoned in view of the filing of the RCE on July 25, 2005. An amendment after final which was also filed July 25, 2005, has been entered. Claims 1, 36, 68, 69, 74, 79, 98 and 99 have been amended. Claims 84-97, 100 and 101 have been canceled. An informational disclosure statement (IDS) filed June 24, 2002, has previously been considered. No amendment to the claims subsequent to the amendment after final filed July 25, 2005 has been filed. Claims 1-83, 98 and 99 are pending.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-35, 36-67, 74-82, 98 and 99 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claims have been amended to include the recitation that "...said surface pathways being either a flat topology with chemical patterning or an indentation, ridge or groove optionally having chemical patterning and flow of said liquid is by thermocapillary stresses." In view of the alternative recitation (or) it is unclear what applicant deems to be the invention. Is the device being operated of a flat configuration, indentation, ridge or groove having chemical patterning ? Contrary to applicants remarks the claims have not been amended to overcome the rejection under 35 USC § 112.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

6. The factual inquiries set forth in *Graham v. John Deere Co.*, 148 USPQ 459, that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or unobviousness.

7. Claims 1-83, presently understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over Figures 11 and 11a of Neukermans. **See column 13, lines 2+ in which Neukermans states that a plurality of heaters (individually activated or as desired) 196 may disposed above below or in both substrates of the “patterned” microfluidic device**

comprised of a plurality of substrates shown in Figures 11 and 11a and selectively actuated to control the movement of the fluid through a respective flow path. A number of flow path configurations including reservoirs and pathways of varying geometric configurations are shown. Regulation of liquids in DNA or peptide sequencing is disclosed. It would have been obvious to one having ordinary skill in the art at the time the invention was made to operate the microfluidic device in particular the respective heaters of Neukermans in order to rout the liquid "...on the patterned surface....". Applicants argue that the "capillary" is an enclosed layer and has amended the claim to include the limitation of "surface pathways". An enclosed "capillary" includes "surface pathways" as recited in the claims. Applicants argue that the instant application is drawn to "open architecture" configuration and "ambient atmosphere" in contact with the "liquid" on the open surface. No such "open architecture" or "ambient atmosphere" relationships are recited in the claims. The claims include recitation that the liquid is received on a patterned surface which is clearly the case with the microfluidic device of the applied patent to Neukermans. Applicants are asked to reconsider the bolded teachings (above) of activation or deactivation of a plurality of heaters to "... prevent or promote the migration of said liquid along one or more surface pathways...". Heating of the liquid moves the fluid along the surfaces of the device of the applied patent to Neukermans. Contrary to applicant's remarks, selective actuation of the plurality of heaters 196 "...prevents (no heat) or promotes (heating) migration of the liquid.". Thermocapillary shear stresses are present in all microfluidic devices. Shear stresses are always present in a microfluidic device and heating or "nonheating" increases or decrease the shear stress effect. Liquid within the microfluidic device of Neukermans as is all fluids in response heat are subjected to thermocapillary shear stresses and some of the liquid would remain in constant contact with a gaseous phase in the fluid flowpath. Again, contrary to applicants' remarks, heating of the fluid would cause migration of the fluid through the capillary device. Use of the heaters to maintain the "pouch" temperature does not preclude it causing

movement of the fluid through the fluidic device. Migration of fluid in response to heat in a microcapillary device is a well known in the microfluidic art. Temperature differential is present in response to actuation of any one of the plurality of heaters 196. Further control by actuation of piezoelectric actuated valves are a further control of the fluid in the microfluidic device of Neukermans. The fluid of Neukermans includes both a liquid and gaseous phase. Note in the abstract that the “microfluidic delivery system” (100) controls both a liquid and a gas.

8. Claims 98 and 99, as understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over pages 353 - 355 of the **“Thermocapillary Pumping of Discrete Drops in Microfabricated Analysis Devices”** by Sammarco et al in view of O’Conner et al . The claims are readable on Sammarco et al with exception of “storing the device in glycerol as taught by column 27, lines 21+. Sammarco et al (who also teach the use of glycerol) teach fluid control by heating of a plurality of fluids and it would have been obvious to one of ordinary skill in the art to operate the microfluidic device by the recited steps of claims 98 and 99 modified in view of O’Conner et al to be stored in glycerol. Application of glycerol on the patterned surface of the microfluidic device (claim 99) is taught by both Sammarco et al and the newly applied patent to O’Conner et al. Control of the fluid would be in response to the differential heating of respective flow paths. Similar remarks as discussed in detail in paragraph 7 as above apply.

Thermocapillary shear stresses (parallel stresses or shear stresses) occur as a function of the differential heating of the fluid in the microfluidic device.


Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Patents to Deshmukh et al and Yang et al are cited of particular interest as showing microfluidic devices whose fluid is moved along device surfaces in response to "...activating one or more heaters..." shown adjacent bubble 42, and heater 35, respectively.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to A. Michael Chambers whose telephone number is 571-272-4908. The examiner can normally be reached on Mon-Thur. 6:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gene Mancene can be reached on 571-272-4930. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


A. Michael Chambers
Primary Examiner
Art Unit 3753

amc
December 7, 2005